FIG. 1

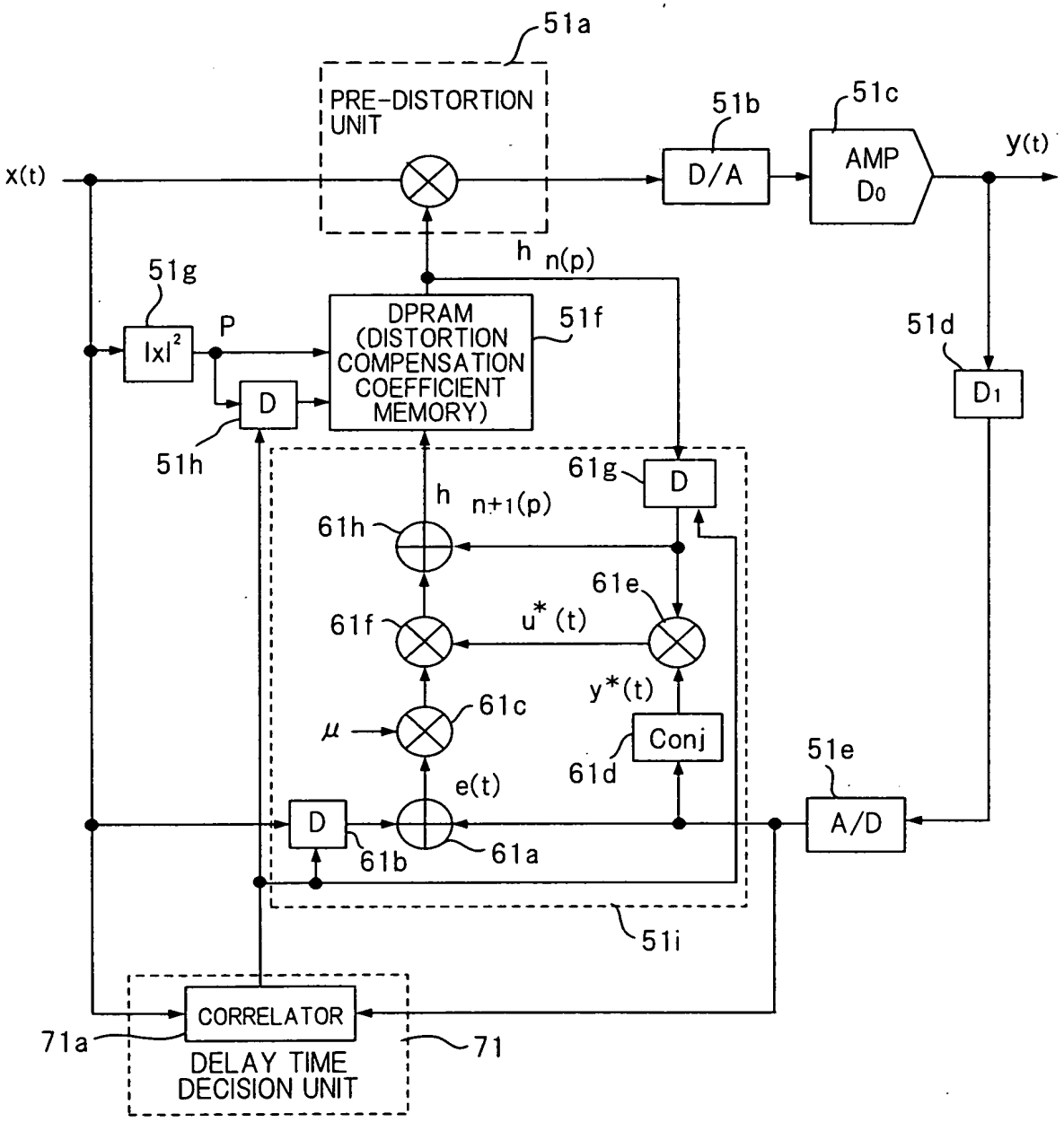
51a
PRE-DISTORTION UNIT
51b
D/A
51c
AMP
D0
y(t)
x(t)
h n(p)
51g
|x|2
P
DPRAM (DISTORTION COMPENSATION COEFFICIENT MEMORY)
51f
51d
D1
D
51h
61g
D
h n+1(p)
61h
61e
61f
u*(t)
y*(t)
61c
μ
Conj
61d
51e
e(t)
D
61b
61a
A/D
51i
CORRELATOR
71a
71
DELAY TIME DECISION UNIT

FIG. 2

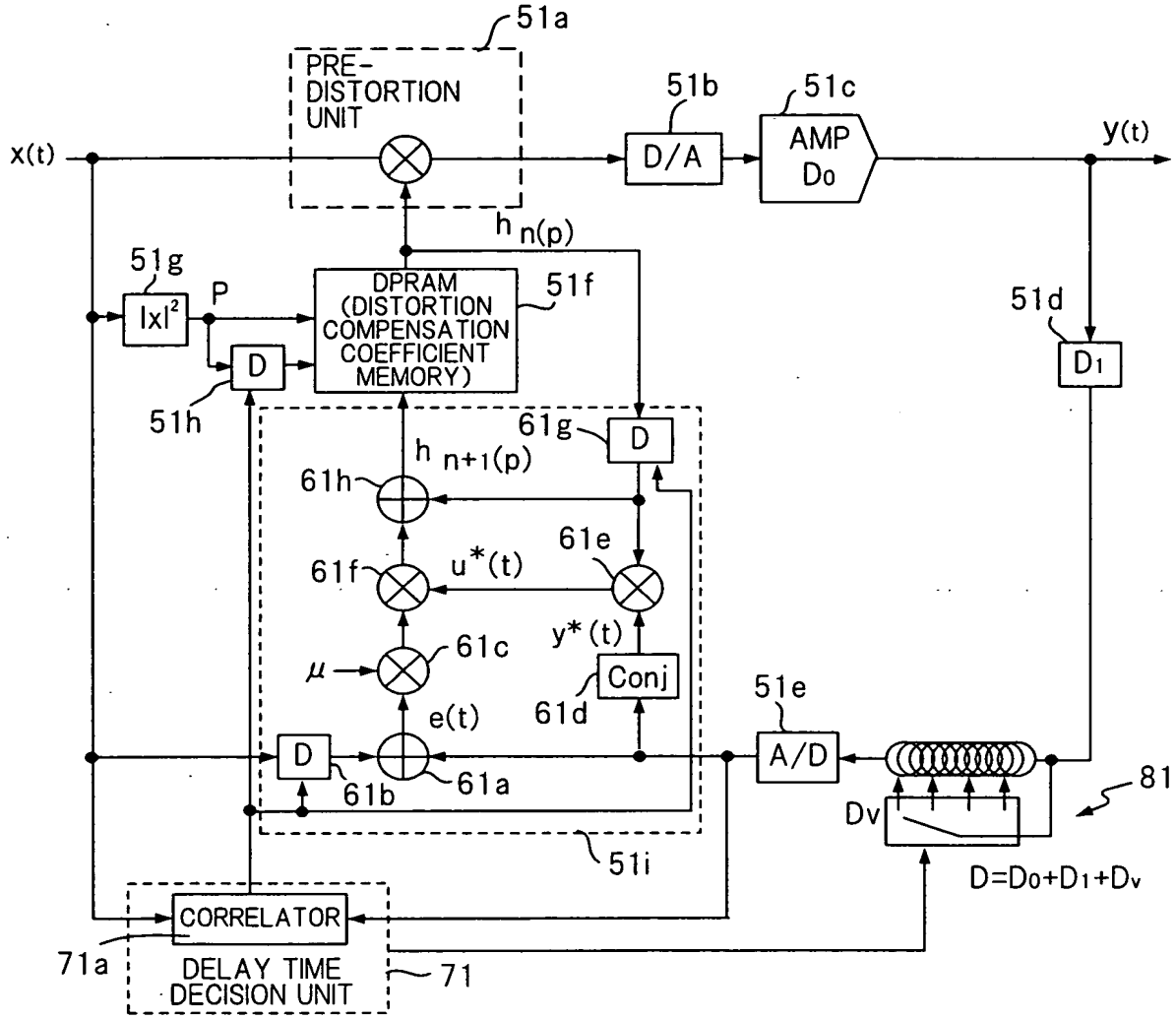
51a
PRE-DISTORTION UNIT
51b
D/A
51c
AMP Do
x(t)
y(t)
h n(p)
51g
|x|²
P
DPRAM (DISTORTION COMPENSATION COEFFICIENT MEMORY)
51f
D
51h
51d
D1
61g
D
h n+1(p)
61h
61e
61f
u*(t)
y*(t)
μ
61c
Conj
61d
e(t)
51e
A/D
D
61b
61a
81
Dv
51i
D=Do+D1+Dv
CORRELATOR
71a
DELAY TIME DECISION UNIT
71

FIG. 3

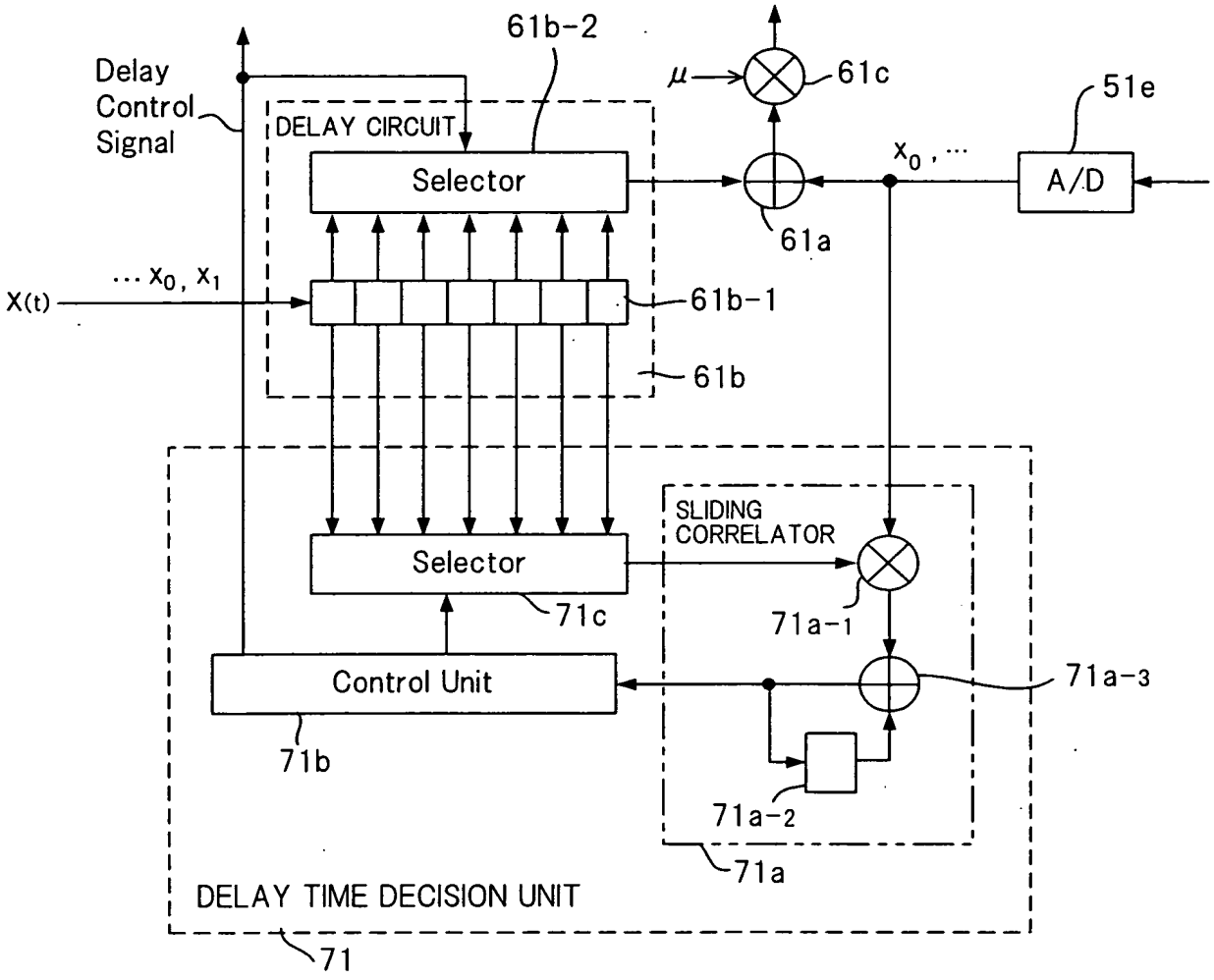

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FIG. 4

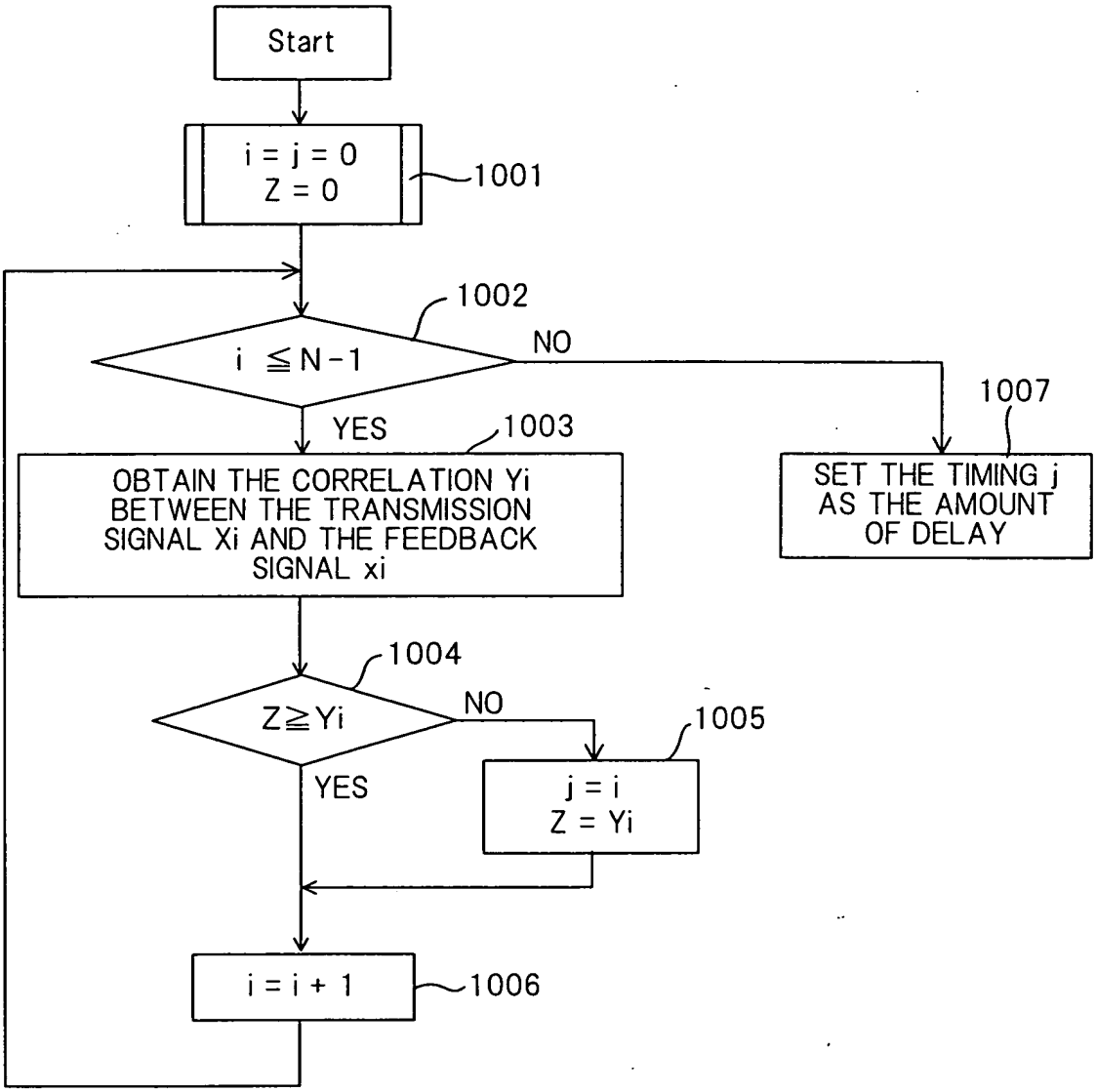
Start
i = j = 0
Z = 0
1001
1002
i ≦ N-1
NO
1007
YES
1003
OBTAIN THE CORRELATION Yi BETWEEN THE TRANSMISSION SIGNAL Xi AND THE FEEDBACK SIGNAL xi
SET THE TIMING j AS THE AMOUNT OF DELAY
1004
Z≧Yi
NO
1005
YES
j = i
Z = Yi
i = i + 1
1006

FIG. 5

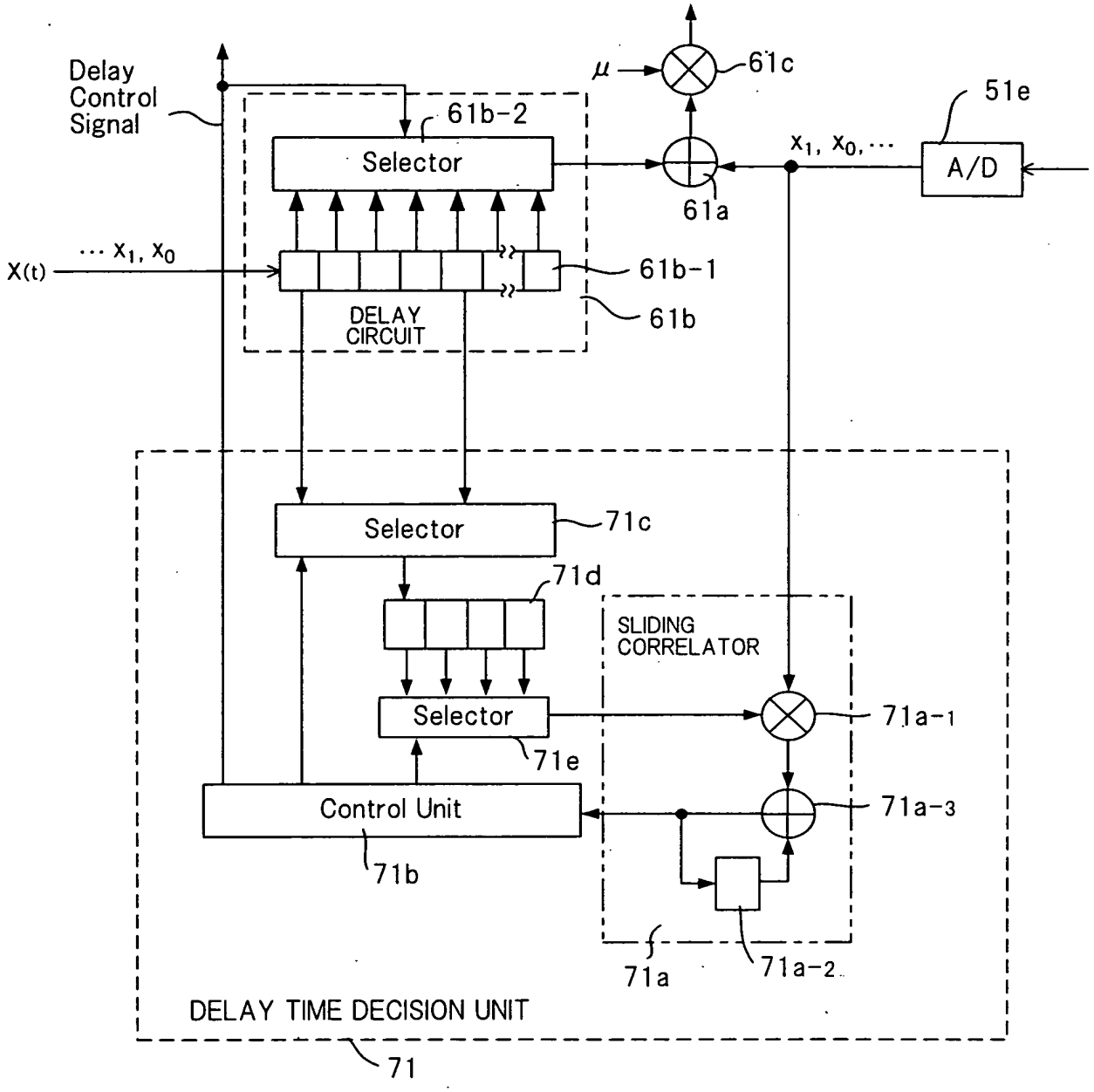

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FIG. 6

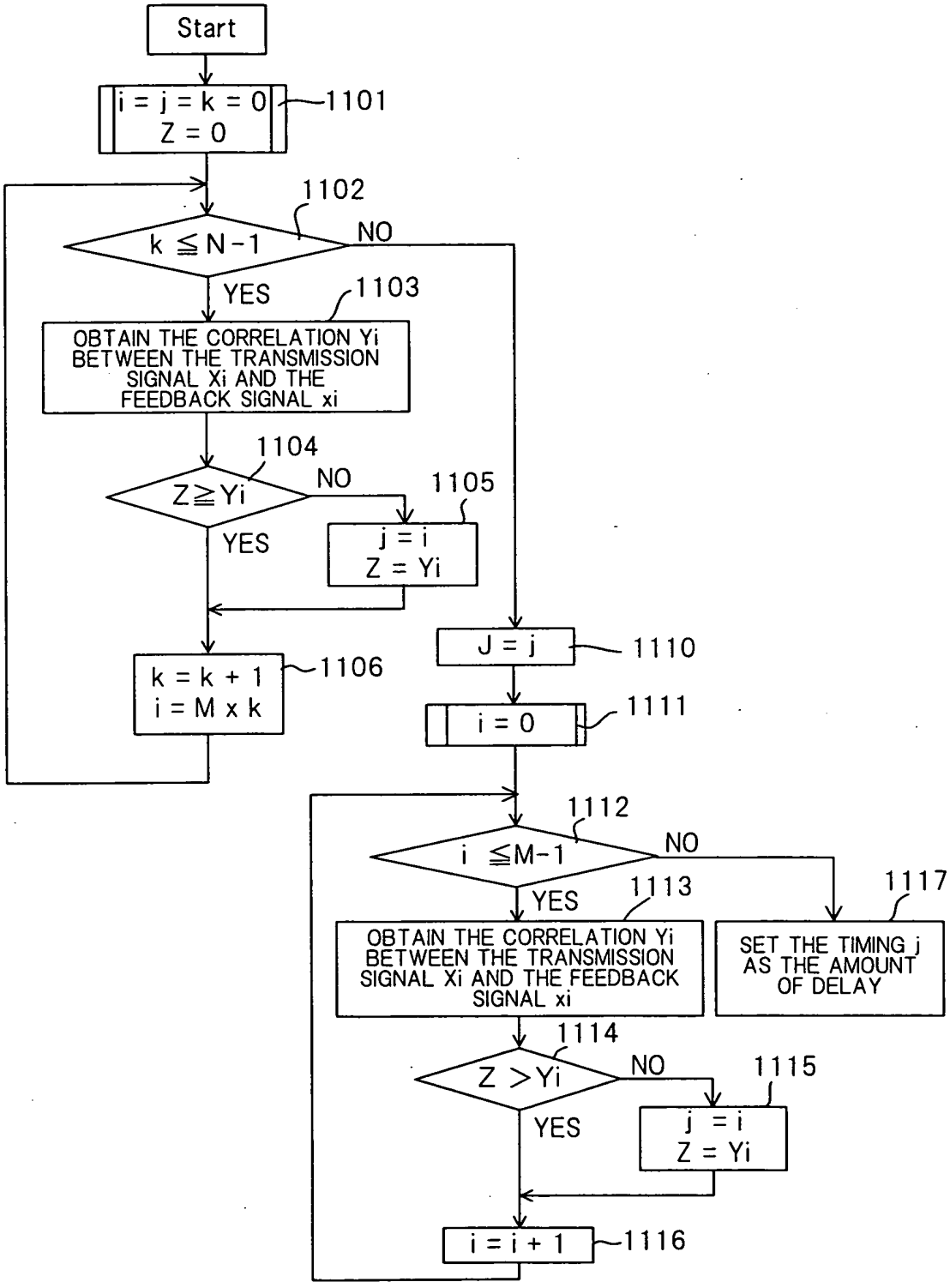
Start
i = j = k = 0
Z = 0
1101
1102
k ≦ N-1
NO
YES
1103
OBTAIN THE CORRELATION Yi BETWEEN THE TRANSMISSION SIGNAL Xi AND THE FEEDBACK SIGNAL xi
1104
Z≧Yi
NO
1105
YES
j = i
Z = Yi
k = k + 1
i = M x k
1106
J = j
1110
i = 0
1111
1112
i ≦M-1
NO
YES
1113
1117
OBTAIN THE CORRELATION Yi BETWEEN THE TRANSMISSION SIGNAL Xi AND THE FEEDBACK SIGNAL xi
SET THE TIMING j AS THE AMOUNT OF DELAY
1114
Z > Yi
NO
1115
YES
j = i
Z = Yi
i = i + 1
1116

FIG. 7

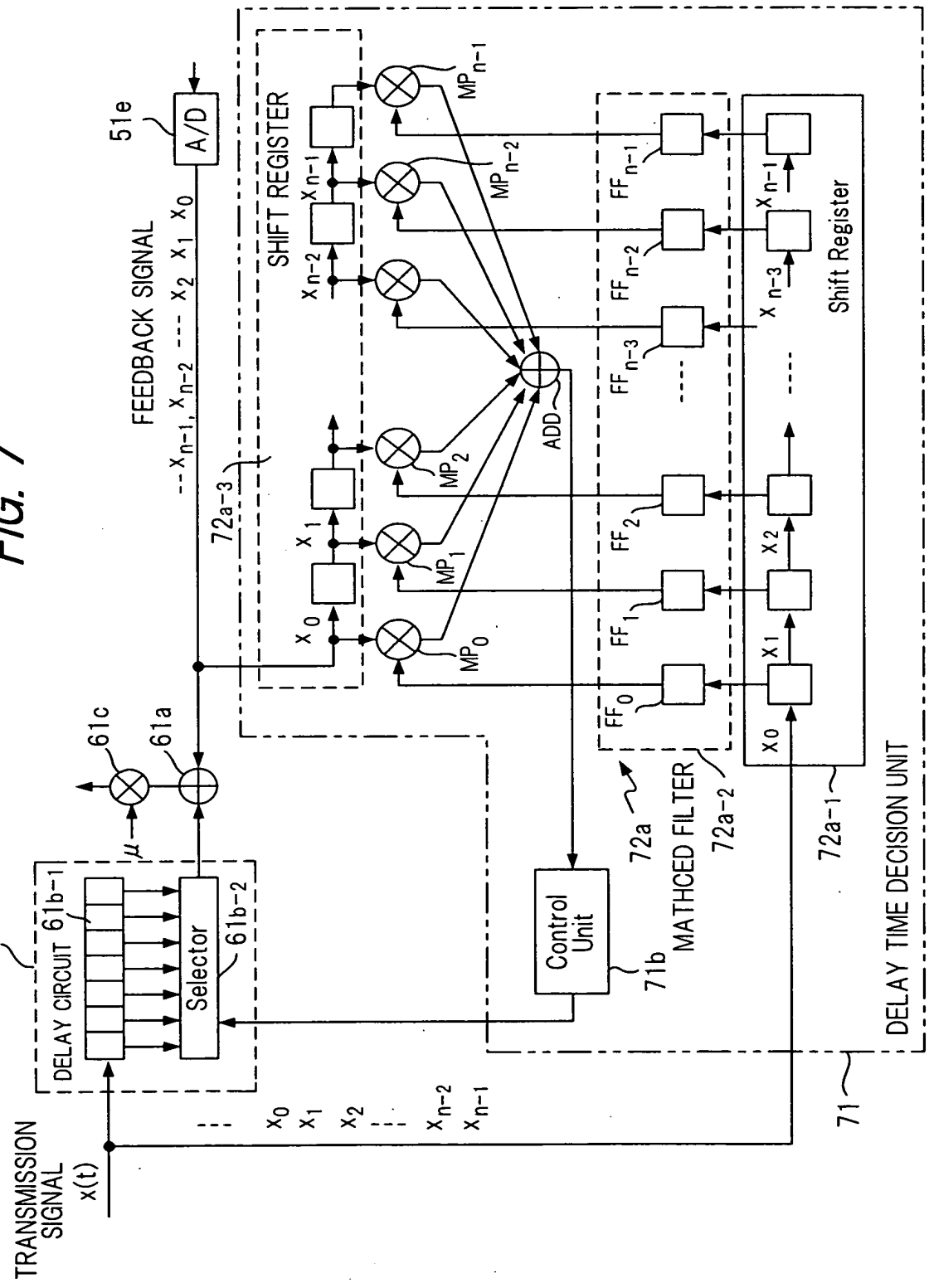
TRANSMISSION SIGNAL
x(t)
61b
DELAY CIRCUIT
61b-1
Selector
61b-2
61c
61a
μ
51e
A/D
FEEDBACK SIGNAL
SHIFT REGISTER
ADD
Control Unit
71b
MATHCED FILTER
72a
72a-2
72a-1
Shift Register
DELAY TIME DECISION UNIT
71

FIG. 8

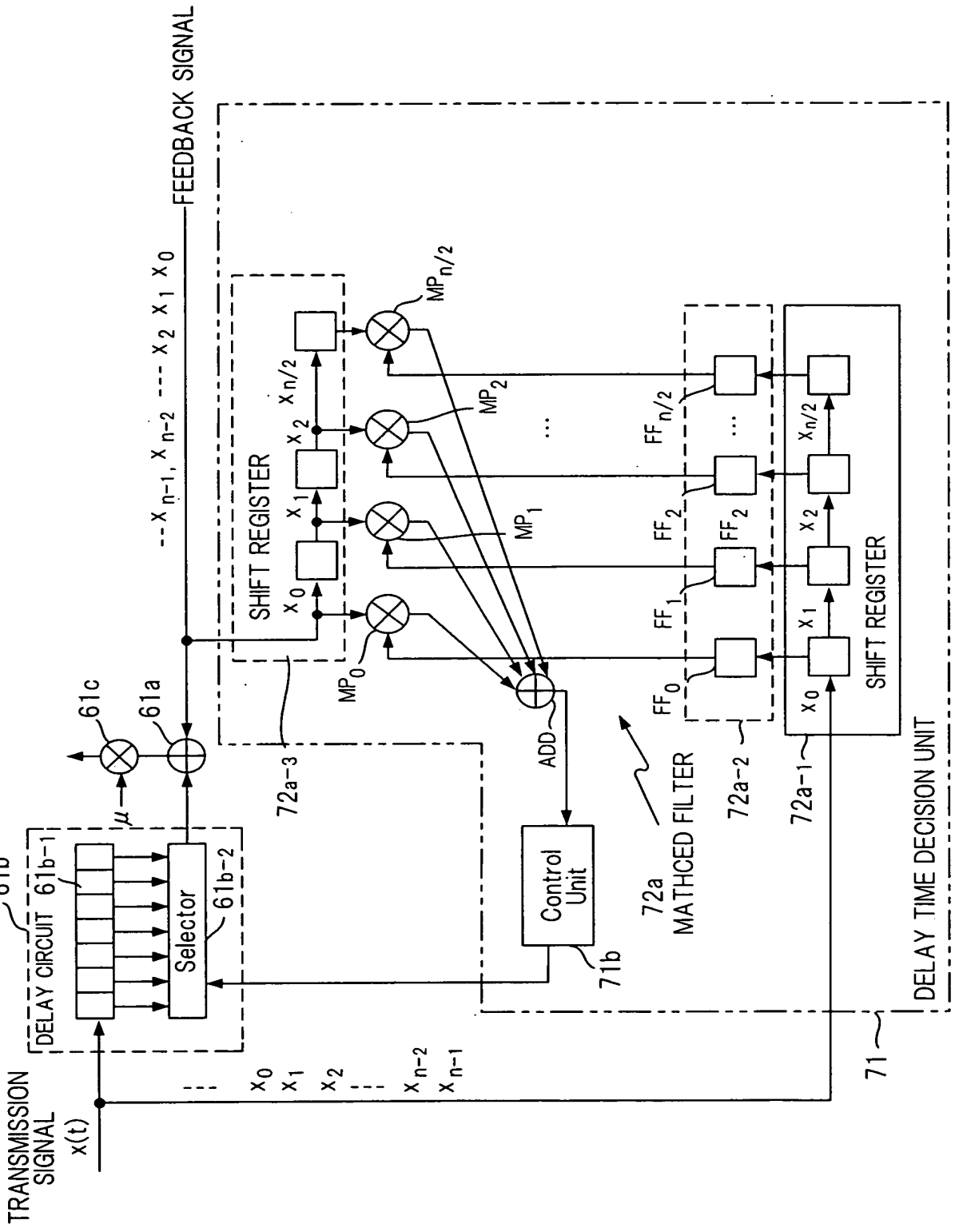
TRANSMISSION SIGNAL
x(t)
DELAY CIRCUIT
61b
61b-1
61b-2
Selector
61c
61a
μ
FEEDBACK SIGNAL
SHIFT REGISTER
72a-3
MP0
MP1
MP2
MPn/2
ADD
Control Unit
71b
72a
MATHCED FILTER
FF0
FF1
FF2
FFn/2
72a-2
72a-1
SHIFT REGISTER
DELAY TIME DECISION UNIT
71

FIG. 9

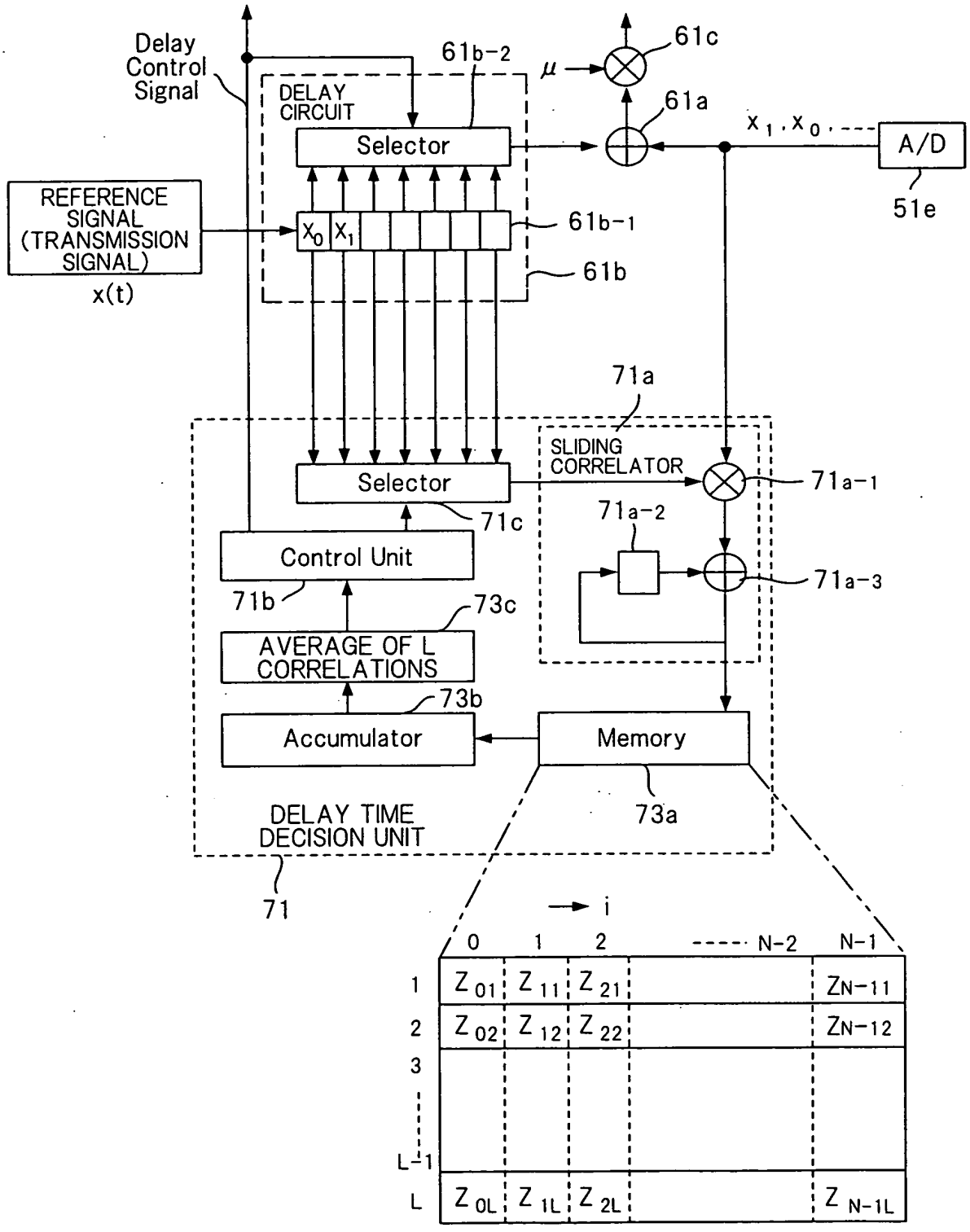

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FIG. 10

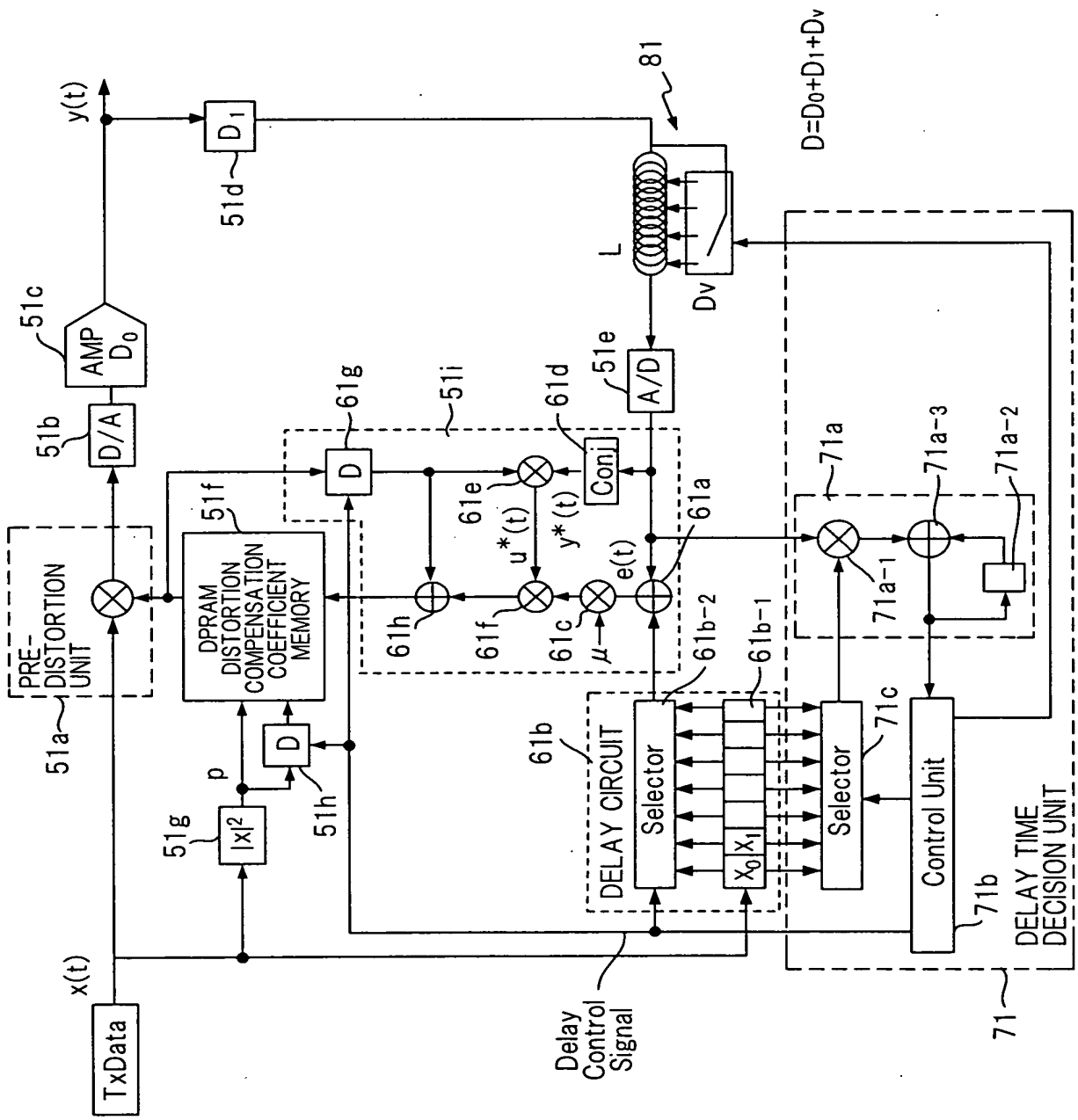
TxData
x(t)
y(t)
PRE-DISTORTION UNIT
51a
D/A
51b
AMP
D_0
51c
D_1
51d
DPRAM DISTORTION COMPENSATION COEFFICIENT MEMORY
51f
51g
$|x|^2$
p
51h
D
61g
51i
61d
Conj
61e
$u^*(t)$
$y^*(t)$
61h
61f
61c
μ
e(t)
61a
A/D
51e
L
Dv
81
$D=D_0+D_1+D_v$
DELAY CIRCUIT
61b
Selector
61b-2
61b-1
X_0 X_1
71a
71a-1
71a-3
71a-2
Selector
71c
Control Unit
71b
DELAY TIME DECISION UNIT
71
Delay Control Signal

FIG. 11

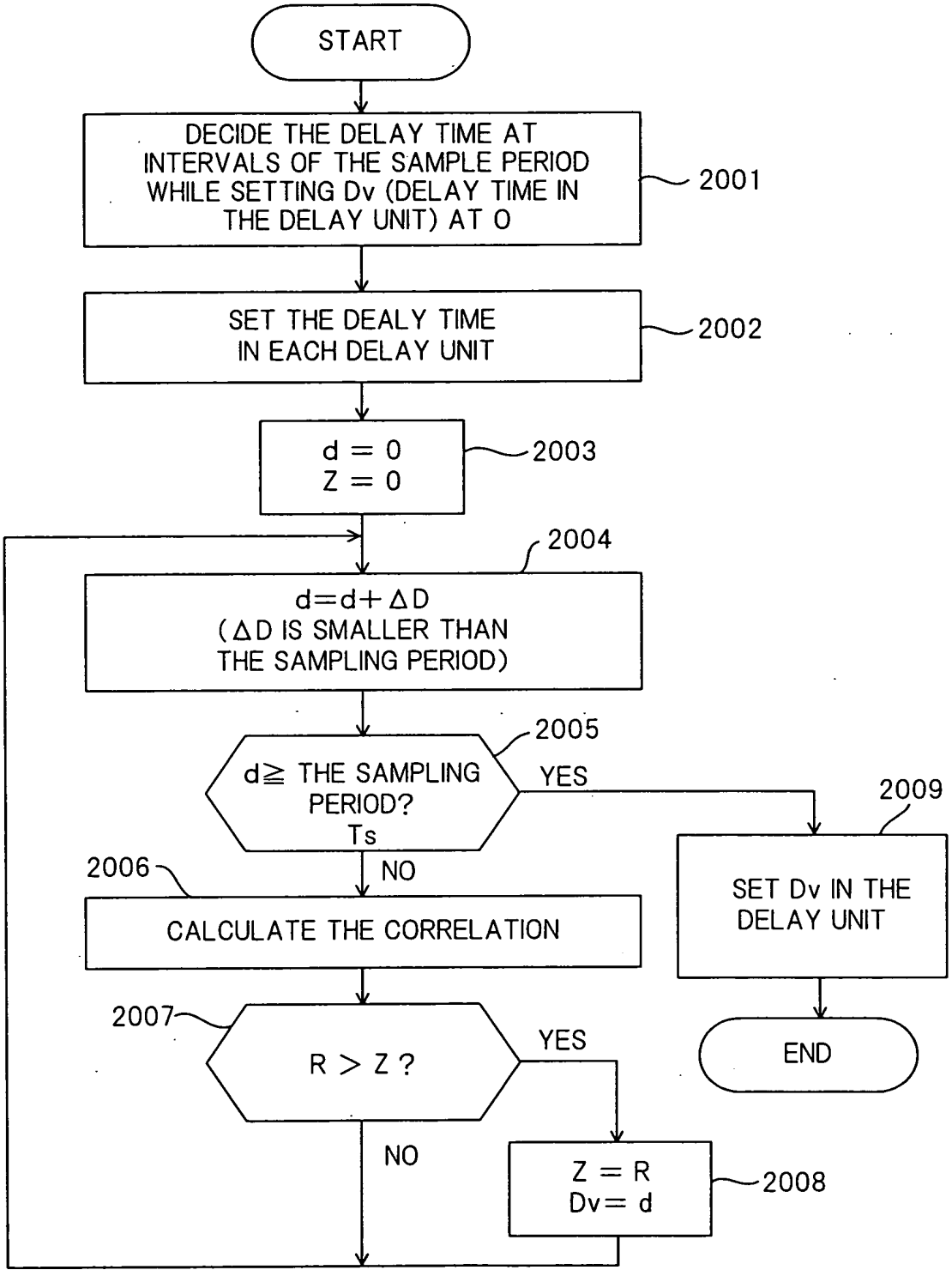
START
DECIDE THE DELAY TIME AT INTERVALS OF THE SAMPLE PERIOD WHILE SETTING Dv (DELAY TIME IN THE DELAY UNIT) AT 0
2001
SET THE DEALY TIME IN EACH DELAY UNIT
2002
d = 0
Z = 0
2003
2004
d=d+ΔD
(ΔD IS SMALLER THAN THE SAMPLING PERIOD)
2005
d≧ THE SAMPLING PERIOD? Ts
YES
2009
SET Dv IN THE DELAY UNIT
END
NO
2006
CALCULATE THE CORRELATION
2007
R > Z ?
YES
NO
Z = R
Dv= d
2008

FIG. 12

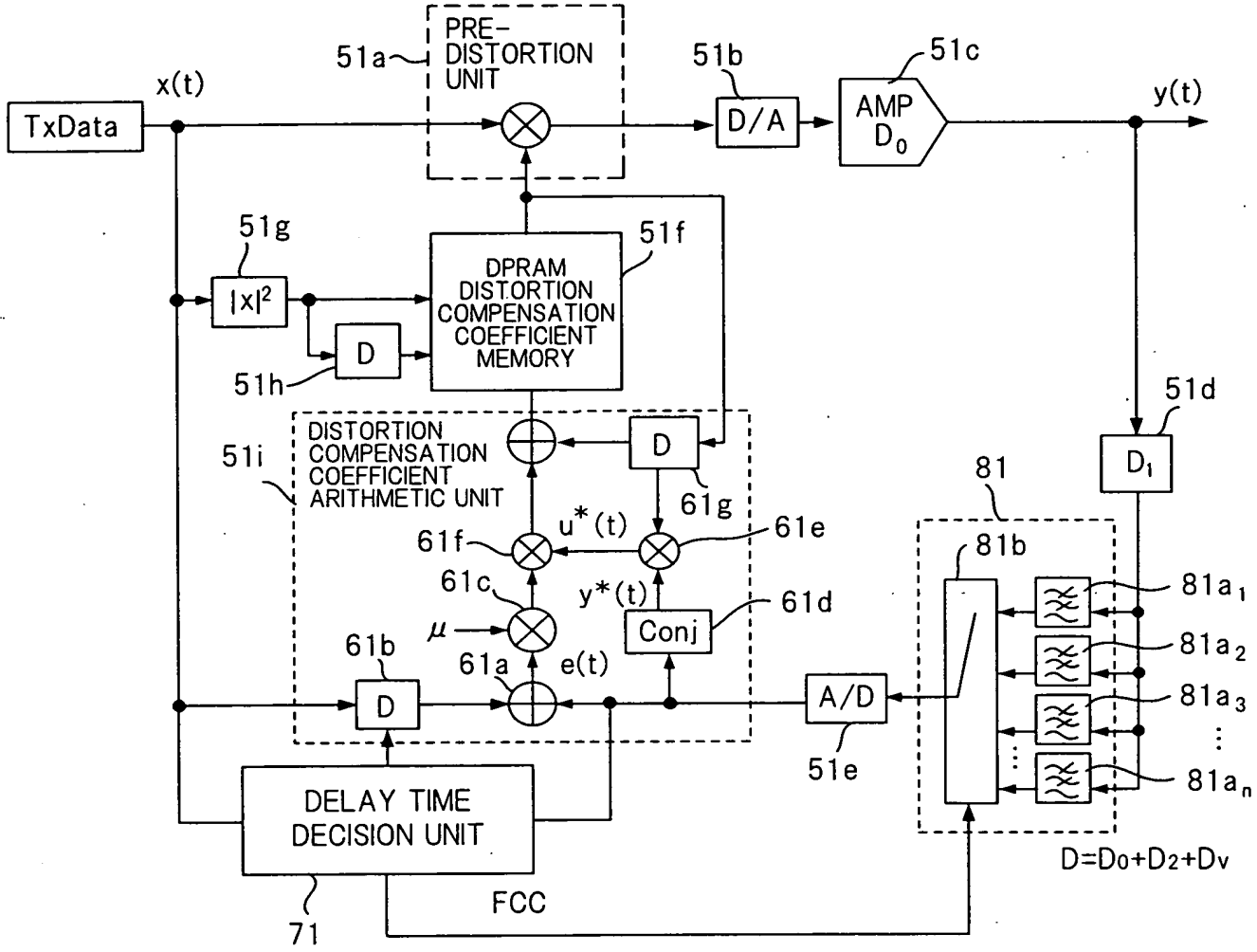
PRE-
DISTORTION
UNIT
51a
51b
51c
x(t)
y(t)
TxData
D/A
AMP
D0
51g
51f
DPRAM
DISTORTION
COMPENSATION
COEFFICIENT
MEMORY
|x|2
D
51h
51d
D1
DISTORTION
COMPENSATION
COEFFICIENT
ARITHMETIC UNIT
51i
81
61g
u*(t)
61f
61e
81b
61c
y*(t)
61d
Conj
μ
61b
61a
e(t)
81a1
81a2
81a3
81an
A/D
51e
DELAY TIME
DECISION UNIT
71
FCC
D=D0+D2+Dv

FIG. 13

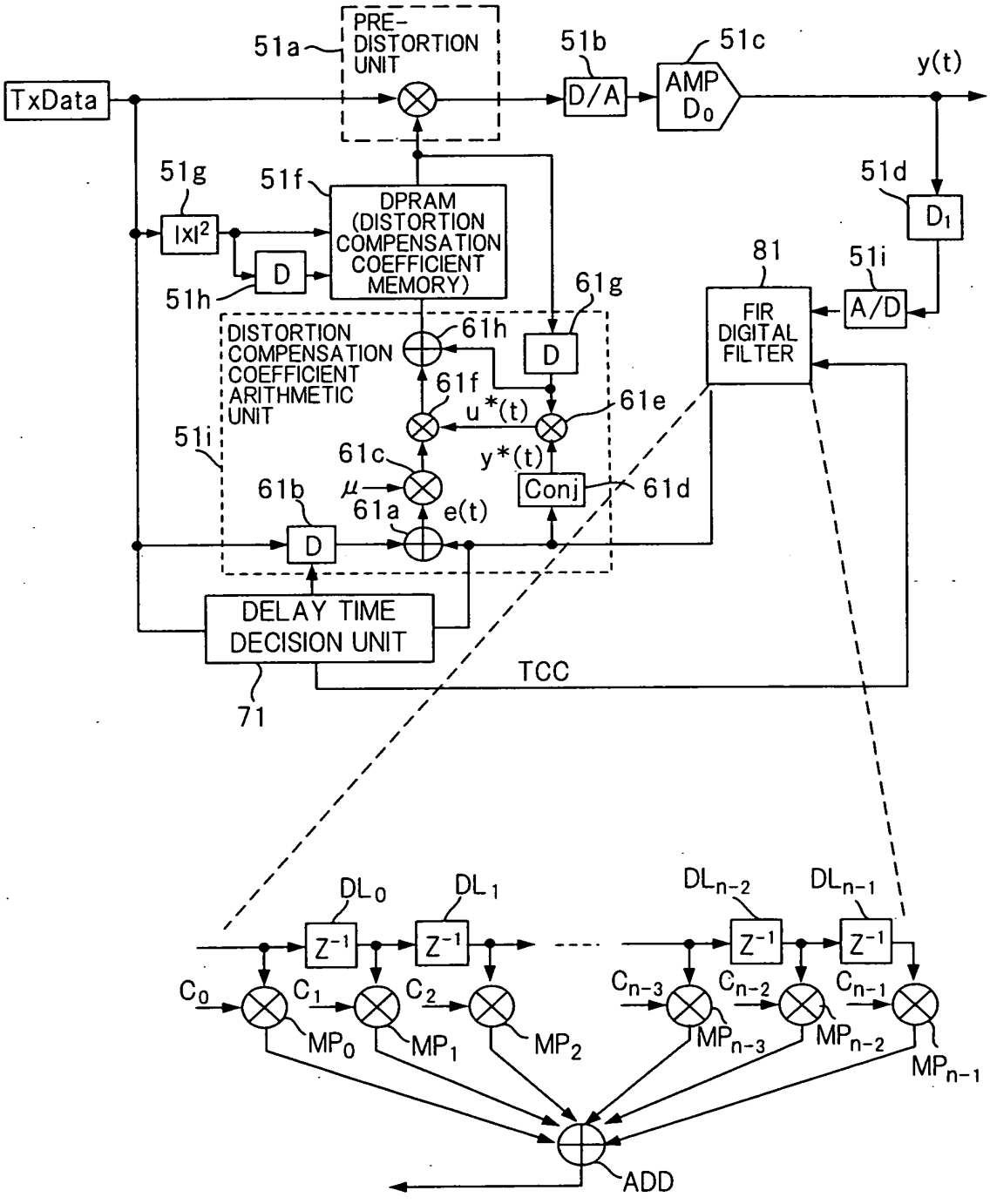
PRE-DISTORTION UNIT
51a
51b
51c
TxData
D/A
AMP D0
y(t)
51g
51f
51d
|x|2
DPRAM (DISTORTION COMPENSATION COEFFICIENT MEMORY)
D1
D
81
51i
51h
61g
FIR DIGITAL FILTER
A/D
DISTORTION COMPENSATION COEFFICIENT ARITHMETIC UNIT
61h
61f
u*(t)
61e
51i
61c
y*(t)
61b
μ
61a
e(t)
Conj
61d
DELAY TIME DECISION UNIT
TCC
71
DL0
DL1
DLn-2
DLn-1
Z-1
C0
C1
C2
Cn-3
Cn-2
Cn-1
MP0
MP1
MP2
MPn-3
MPn-2
MPn-1
ADD

FIG. 14A

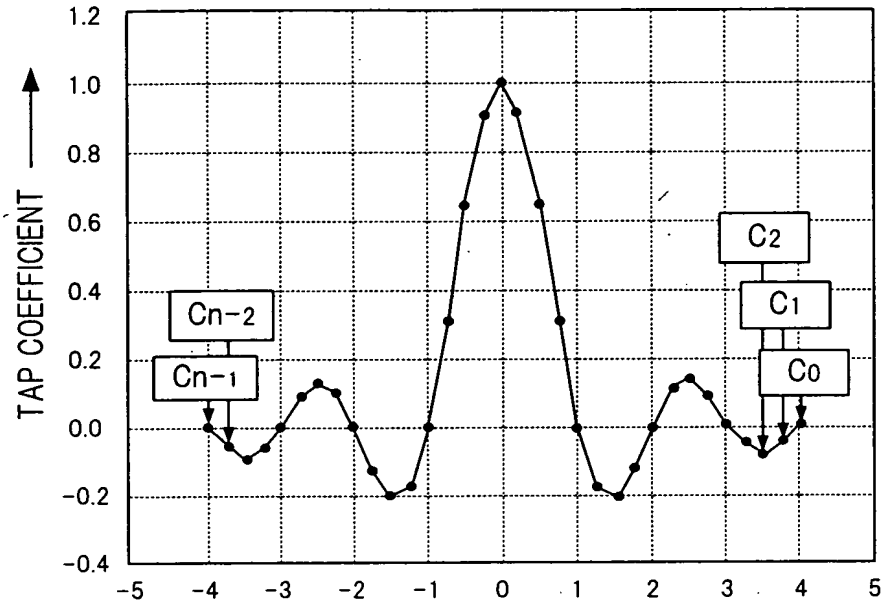

FIG. 14B

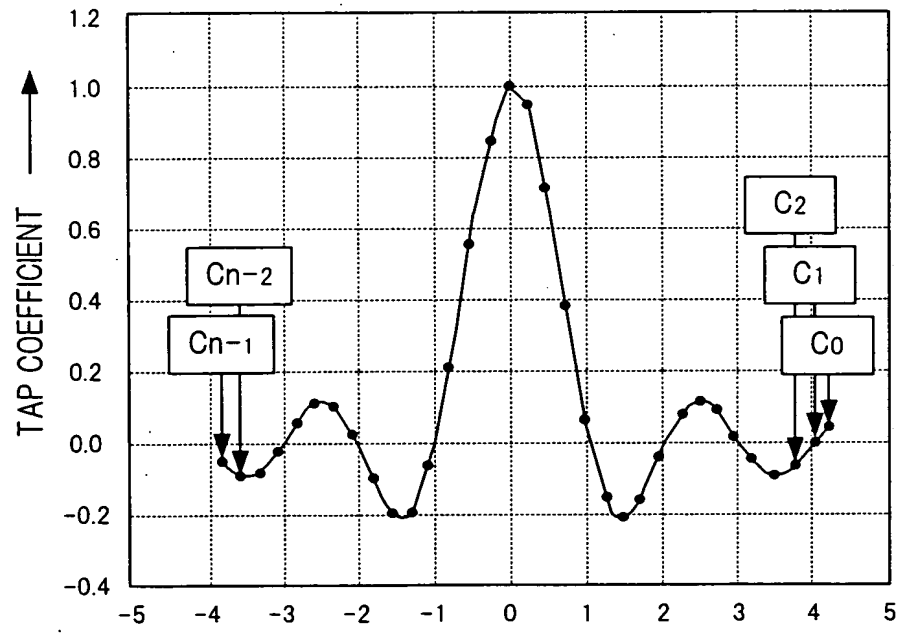

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FIG. 15

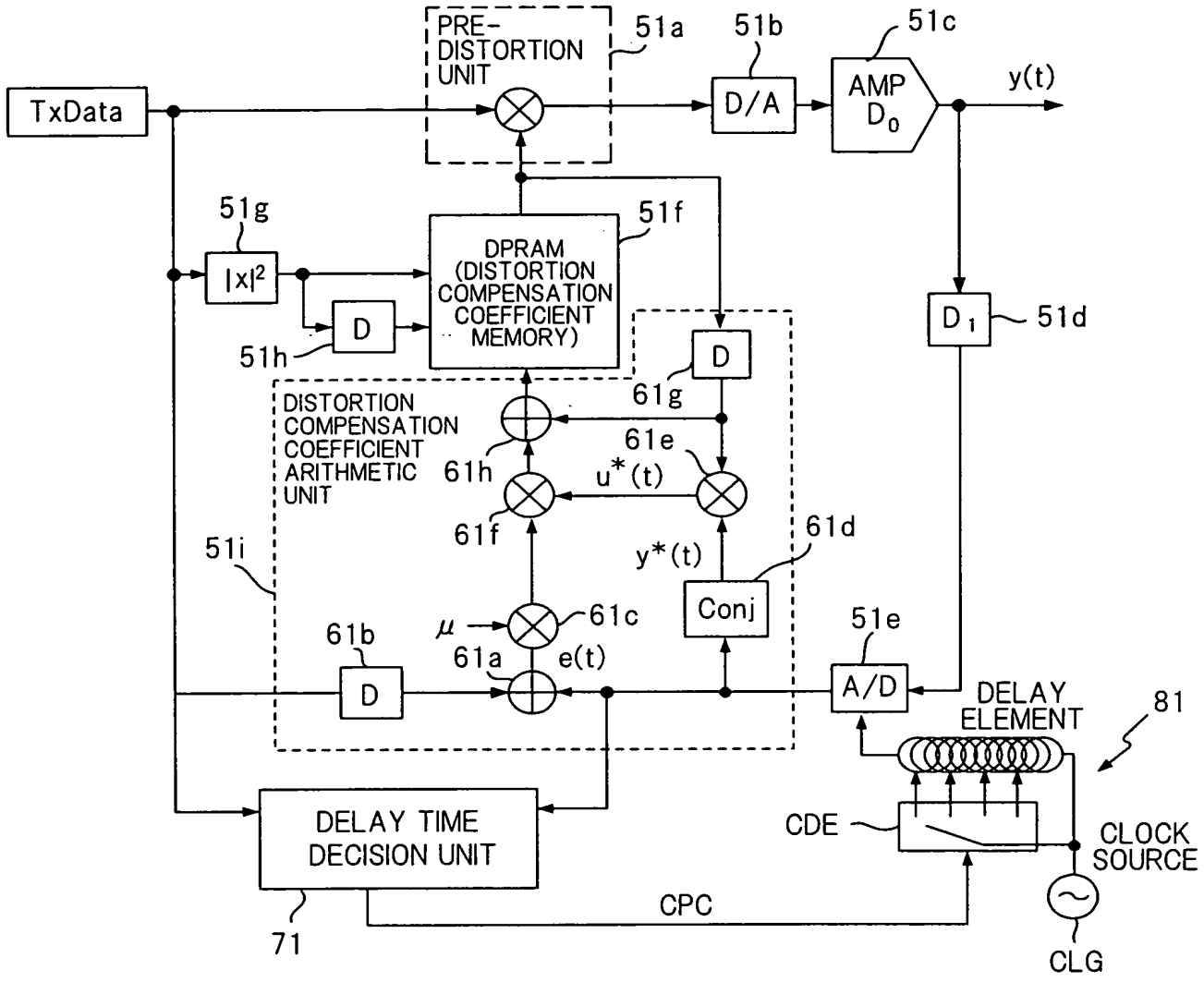

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FIG. 16

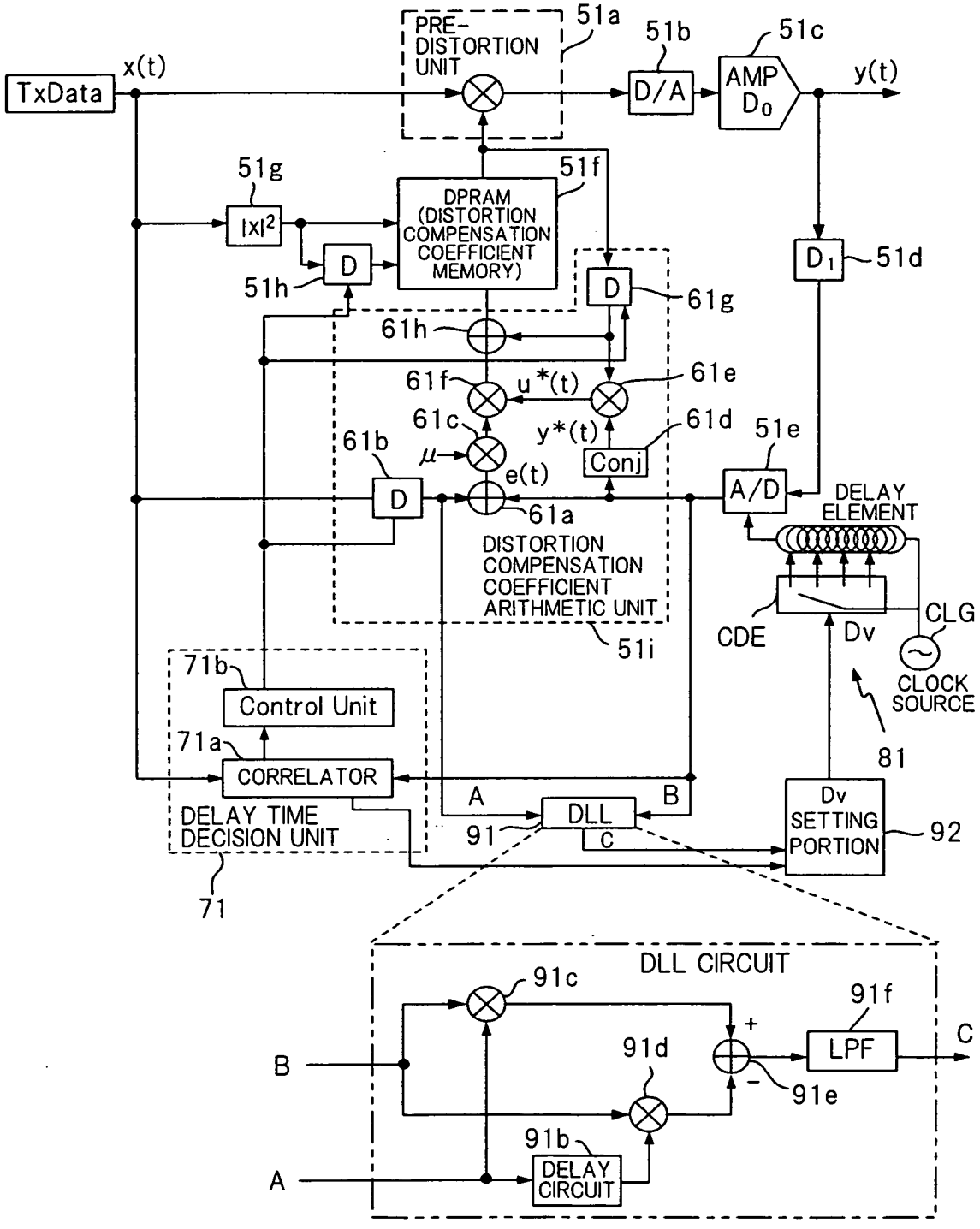
TxData
x(t)
PRE-DISTORTION UNIT
51a
51b
D/A
51c
AMP D0
y(t)
51g
|x|2
51f
DPRAM (DISTORTION COMPENSATION COEFFICIENT MEMORY)
D
51h
D1
51d
61g
61h
61f
u*(t)
61e
61c
y*(t)
61d
61b
μ
e(t)
Conj
51e
A/D
61a
DELAY ELEMENT
DISTORTION COMPENSATION COEFFICIENT ARITHMETIC UNIT
51i
CDE
Dv
CLG
CLOCK SOURCE
81
71b
Control Unit
71a
CORRELATOR
DELAY TIME DECISION UNIT
71
A
B
91
DLL
C
Dv SETTING PORTION
92
DLL CIRCUIT
91c
91f
+
LPF
C
B
91d
91e
91b
DELAY CIRCUIT
A

FIG. 17 PRIOR ART

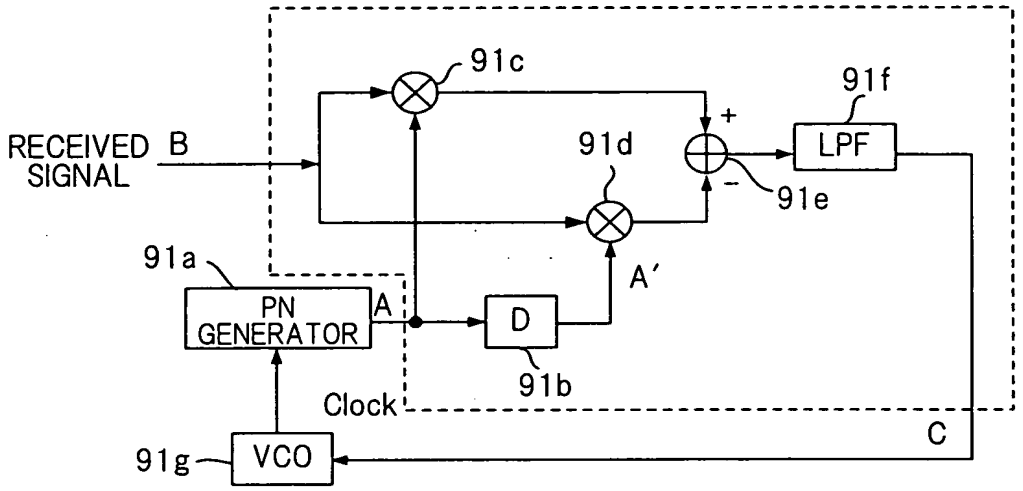

FIG. 18 PRIOR ART

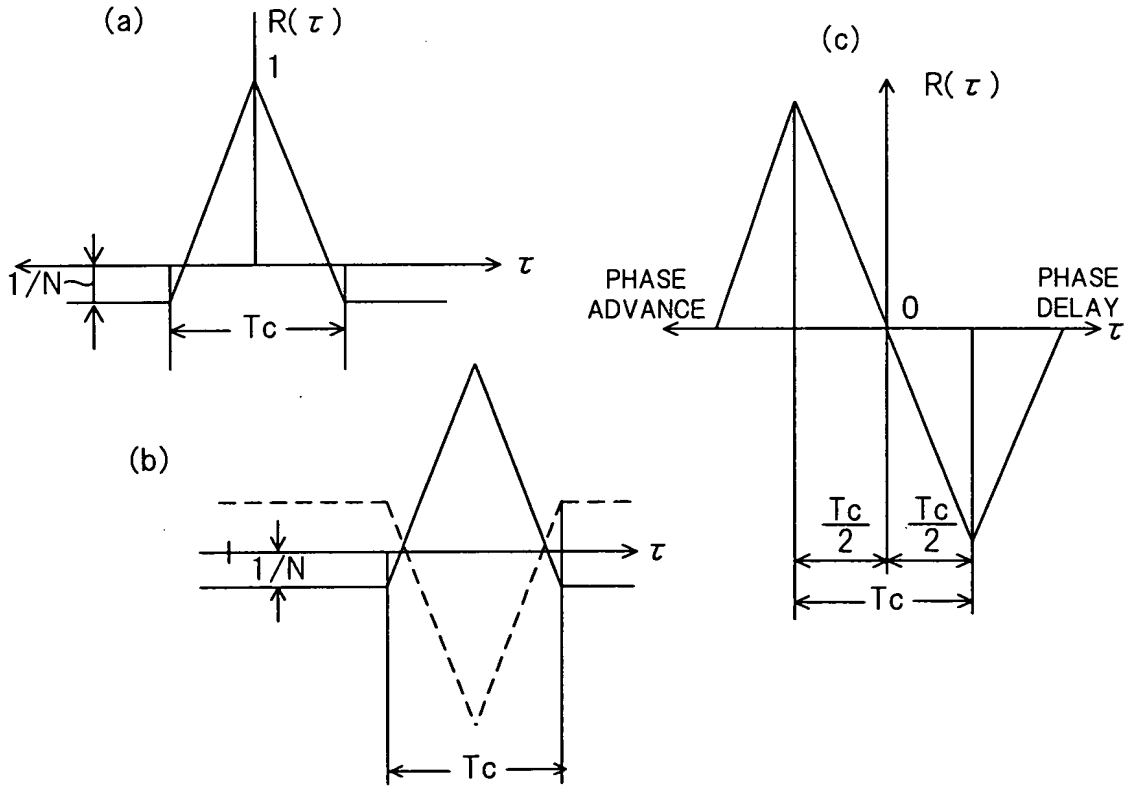

FIG. 19

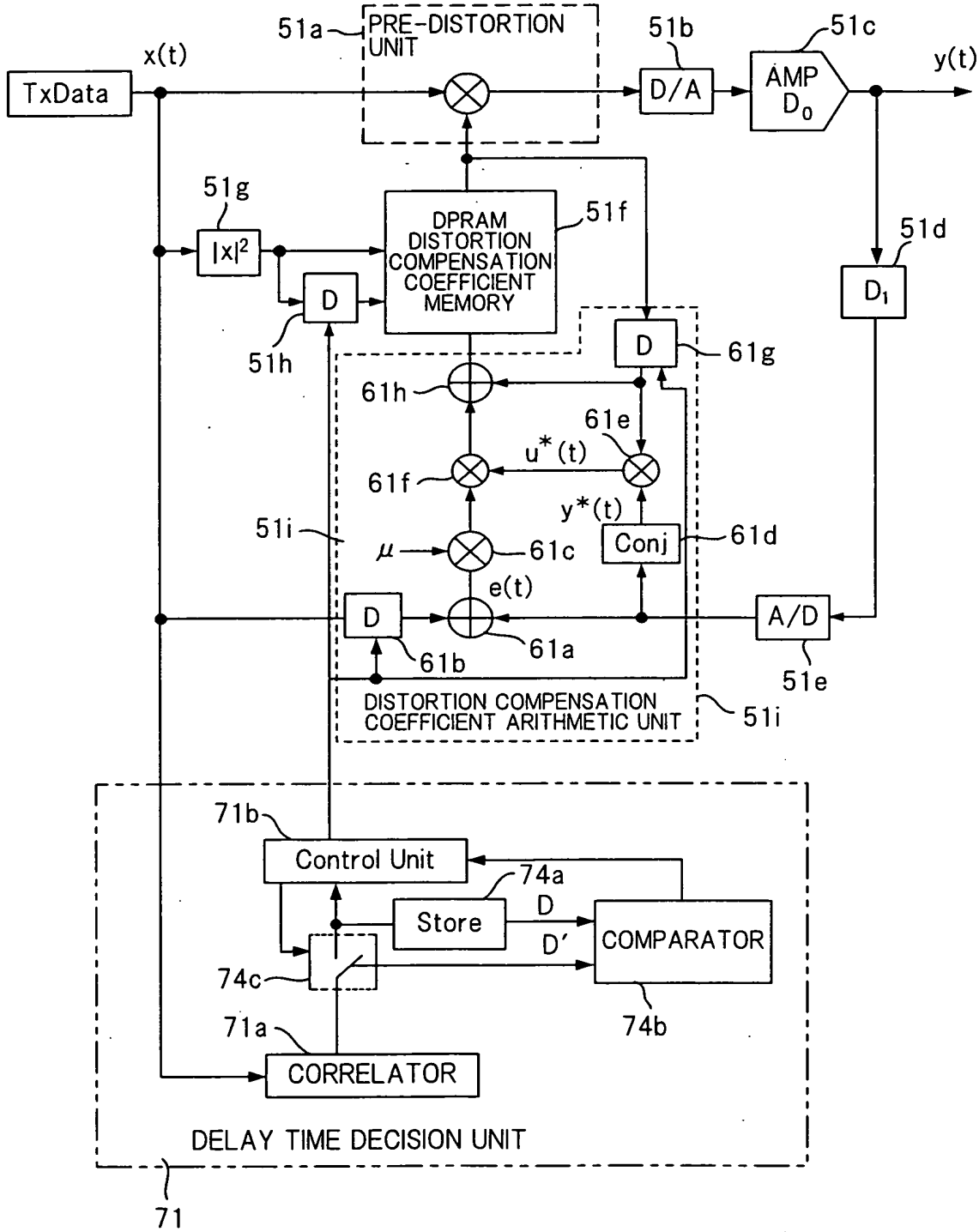

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FIG. 20

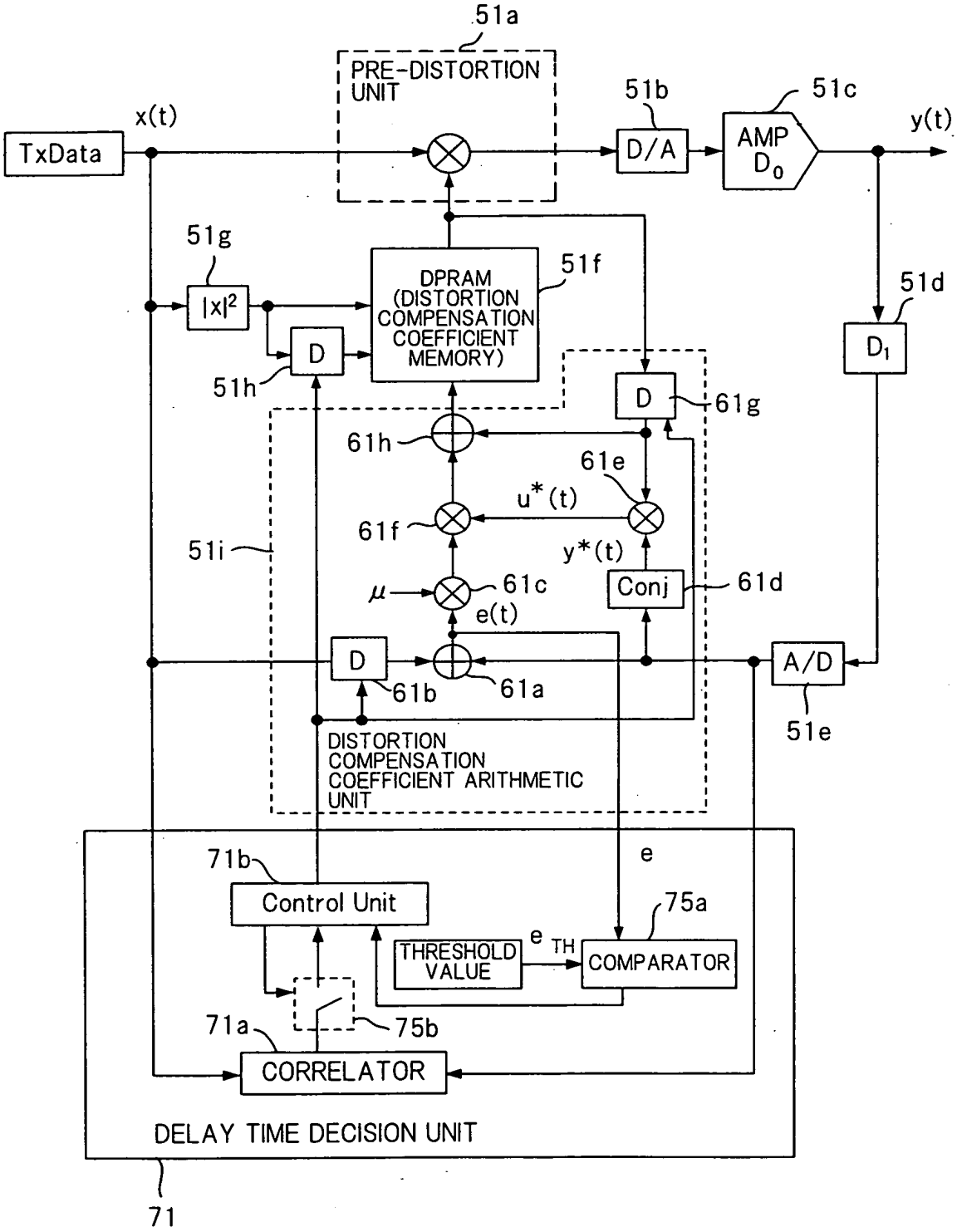
51a
PRE-DISTORTION UNIT
x(t)
TxData
51b
D/A
51c
AMP
D_0
y(t)
51g
$|x|^2$
D
51h
DPRAM (DISTORTION COMPENSATION COEFFICIENT MEMORY)
51f
51d
D_1
D
61g
61h
61e
$u^*(t)$
61f
$y^*(t)$
51i
μ
61c
Conj
61d
e(t)
D
61b
61a
A/D
51e
DISTORTION COMPENSATION COEFFICIENT ARITHMETIC UNIT
71b
Control Unit
e
75a
THRESHOLD VALUE
e_{TH}
COMPARATOR
71a
75b
CORRELATOR
DELAY TIME DECISION UNIT
71

FIG. 21

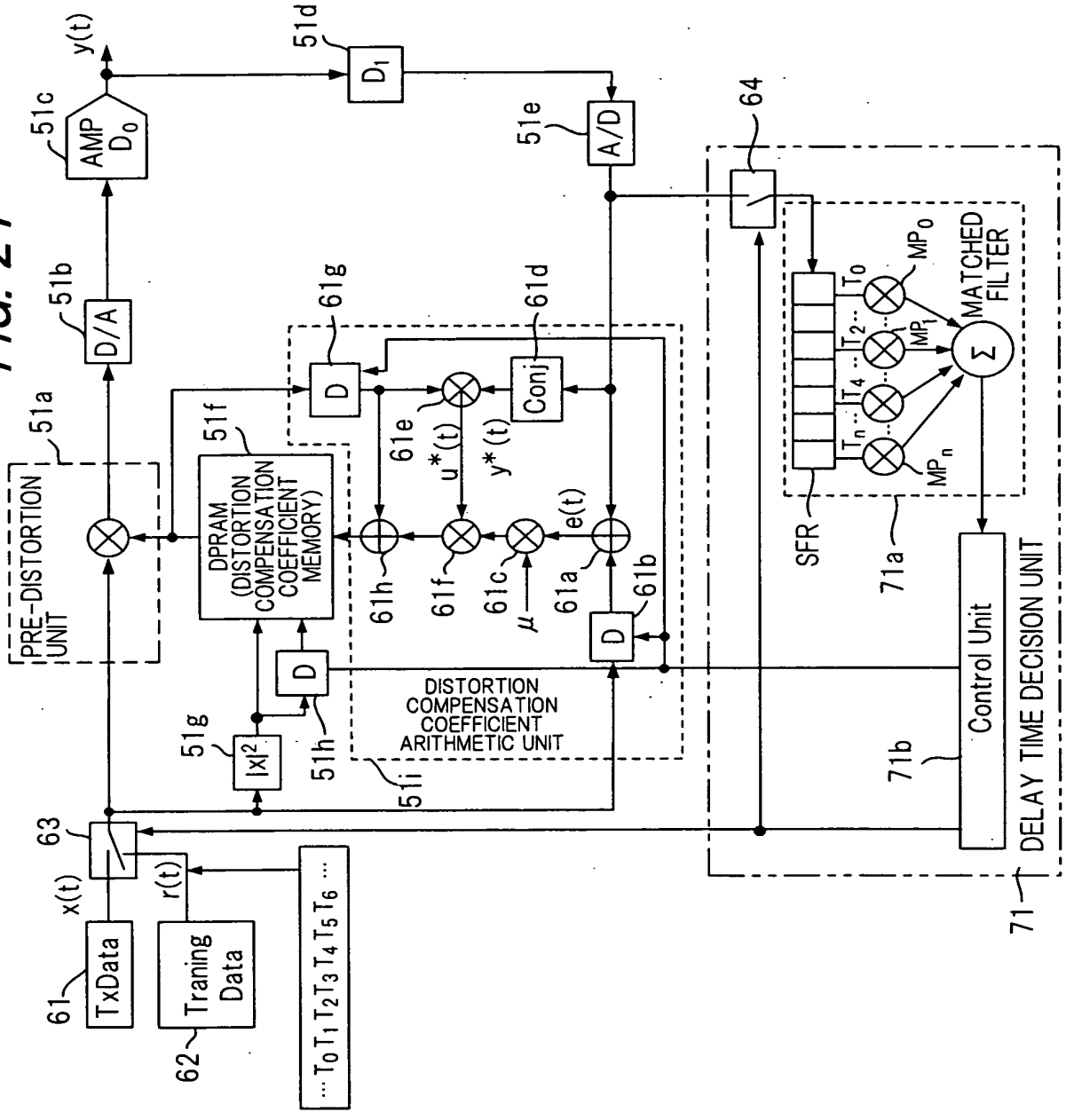
y(t)
51c
AMP
D_0
51d
D_1
51e
A/D
64
51b
D/A
61g
61d
51a
51f
D
Conj
61e
$u^*(t)$
$y^*(t)$
PRE-DISTORTION UNIT
DPRAM (DISTORTION COMPENSATION COEFFICIENT MEMORY)
61h
61f
61c
μ
61a
e(t)
61b
D
51h
51g
$|x|^2$
51i
DISTORTION COMPENSATION COEFFICIENT ARITHMETIC UNIT
63
x(t)
r(t)
61
TxData
62
Traning Data
... $T_0 T_1 T_2 T_3 T_4 T_5 T_6$ ...
T_0
MP_0
T_2
MP_1
T_4
T_n
MP_n
MATCHED FILTER
Σ
SFR
71a
Control Unit
71b
DELAY TIME DECISION UNIT
71

FIG. 22

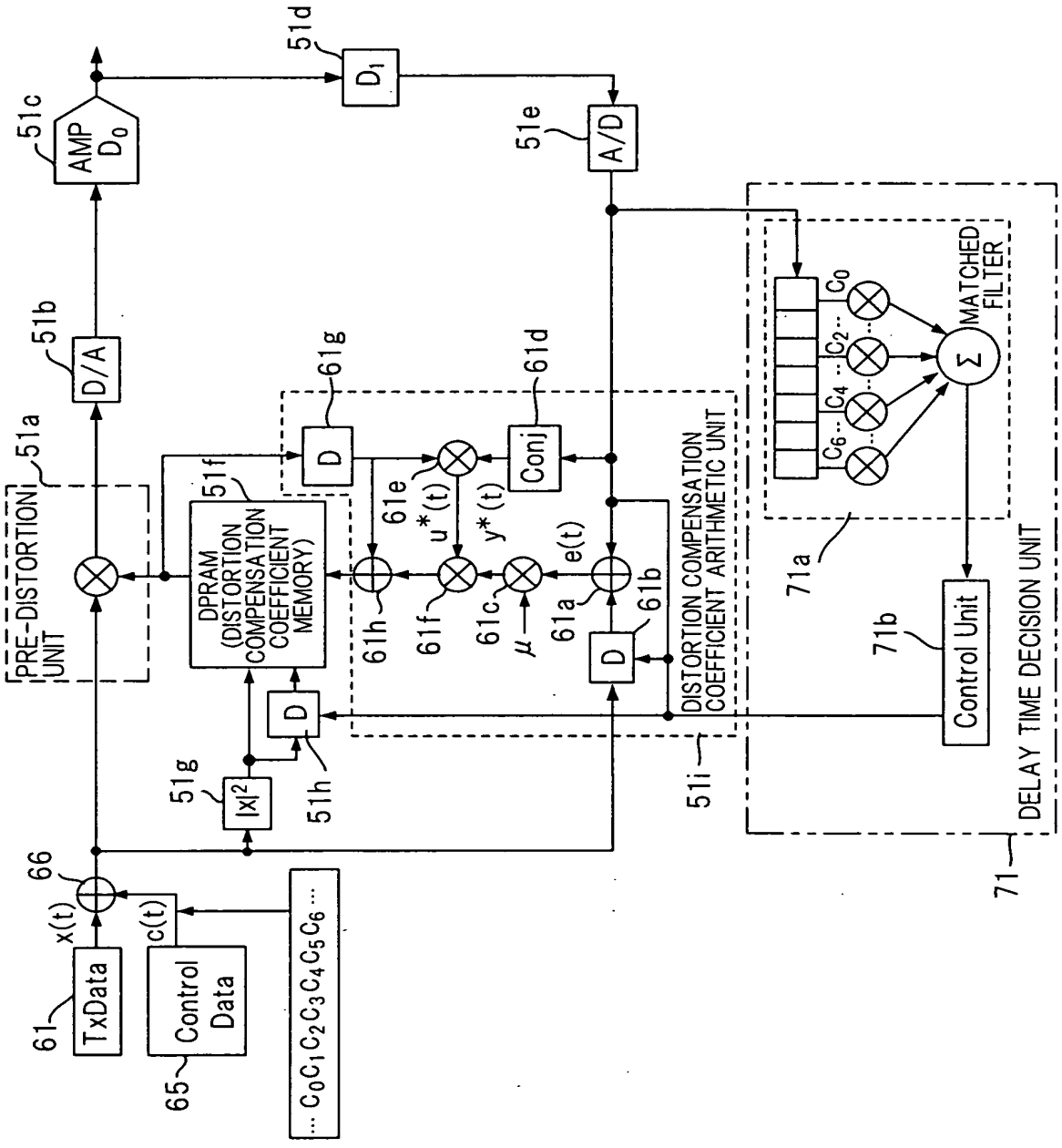
61
TxData
x(t)
66
65
Control Data
c(t)
... C0C1C2C3C4C5C6 ...
51c
AMP D0
51d
D1
51e
A/D
51b
D/A
51a
PRE-DISTORTION UNIT
51f
DPRAM (DISTORTION COMPENSATION COEFFICIENT MEMORY)
51g
|x|2
51h
61g
D
61e
u*(t)
61h
61f
61c
μ
y*(t)
61d
Conj
61a
e(t)
61b
D
51i
DISTORTION COMPENSATION COEFFICIENT ARITHMETIC UNIT
C0
C2
C4
C6
Σ
MATCHED FILTER
71a
71b
Control Unit
71
DELAY TIME DECISION UNIT

FIG. 23 PRIOR ART

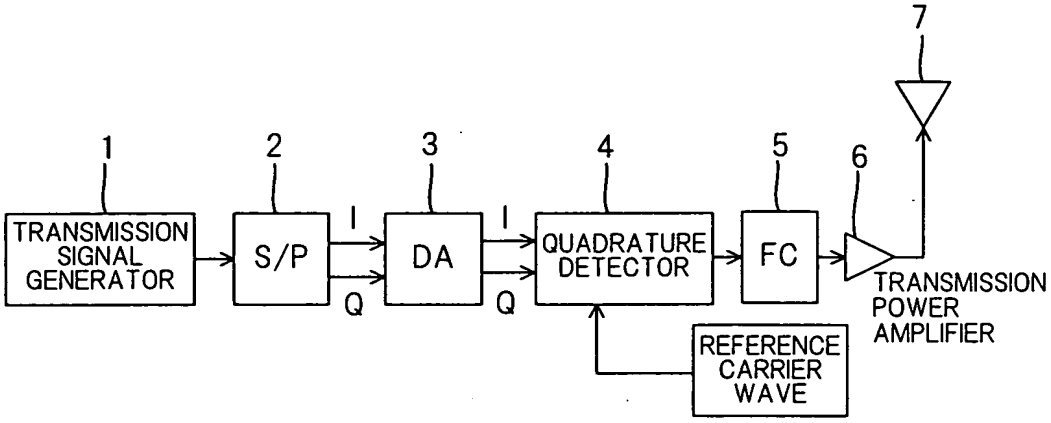

FIG. 24A PRIOR ART

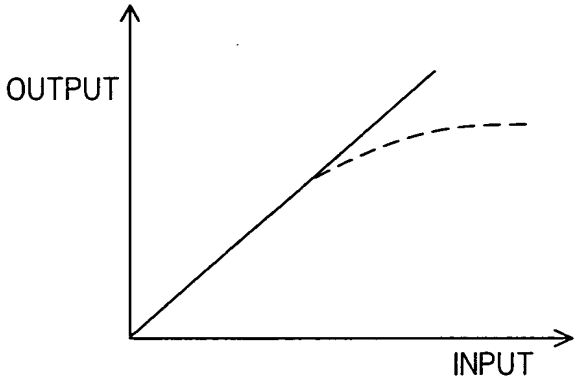

FIG. 24B PRIOR ART

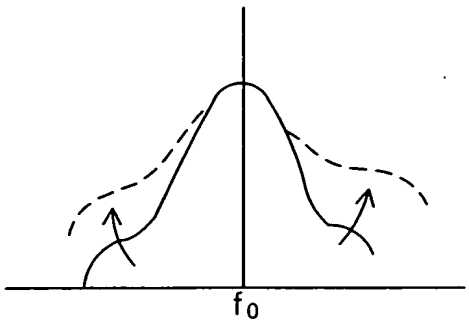

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FIG. 25 PRIOR ART

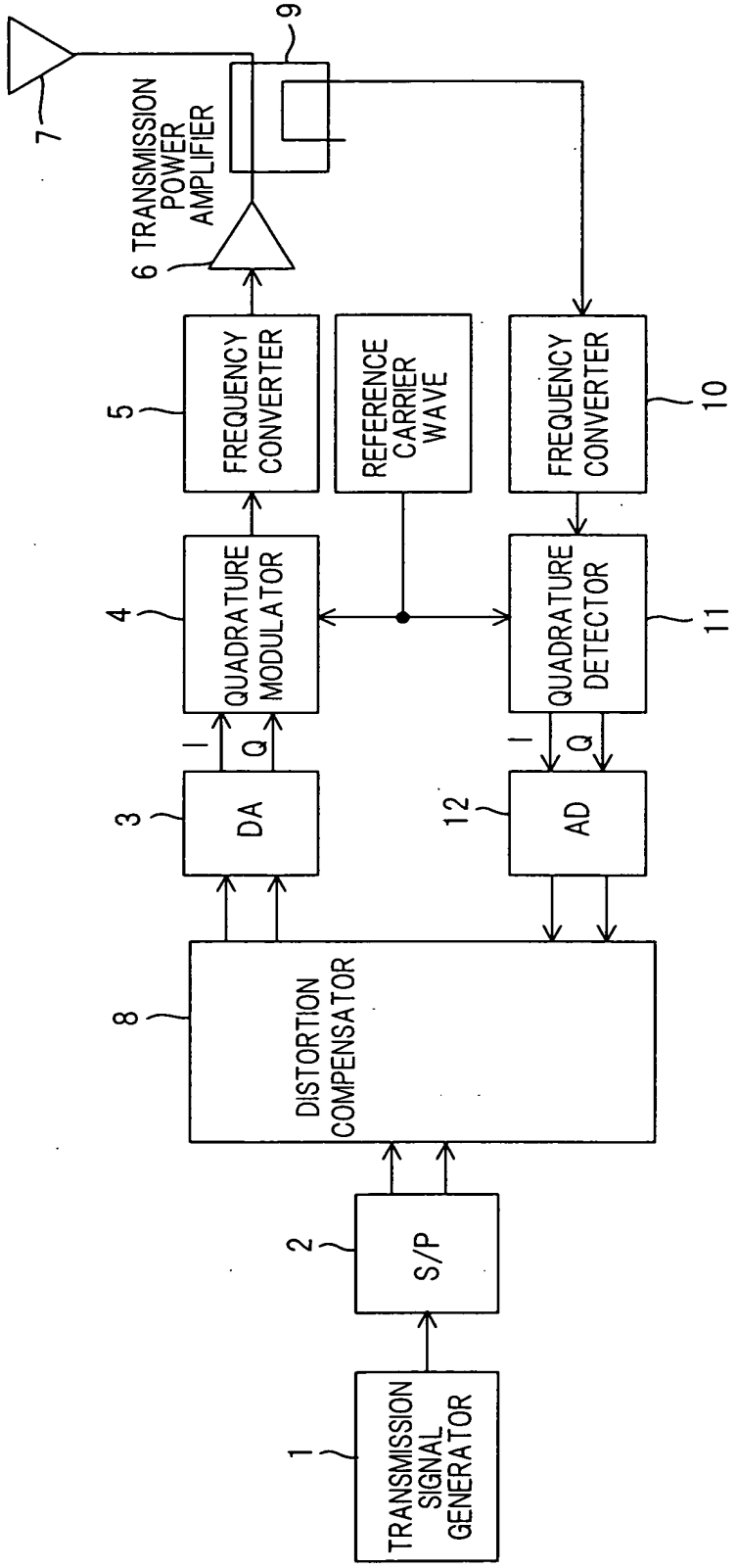

FIG. 26 PRIOR ART

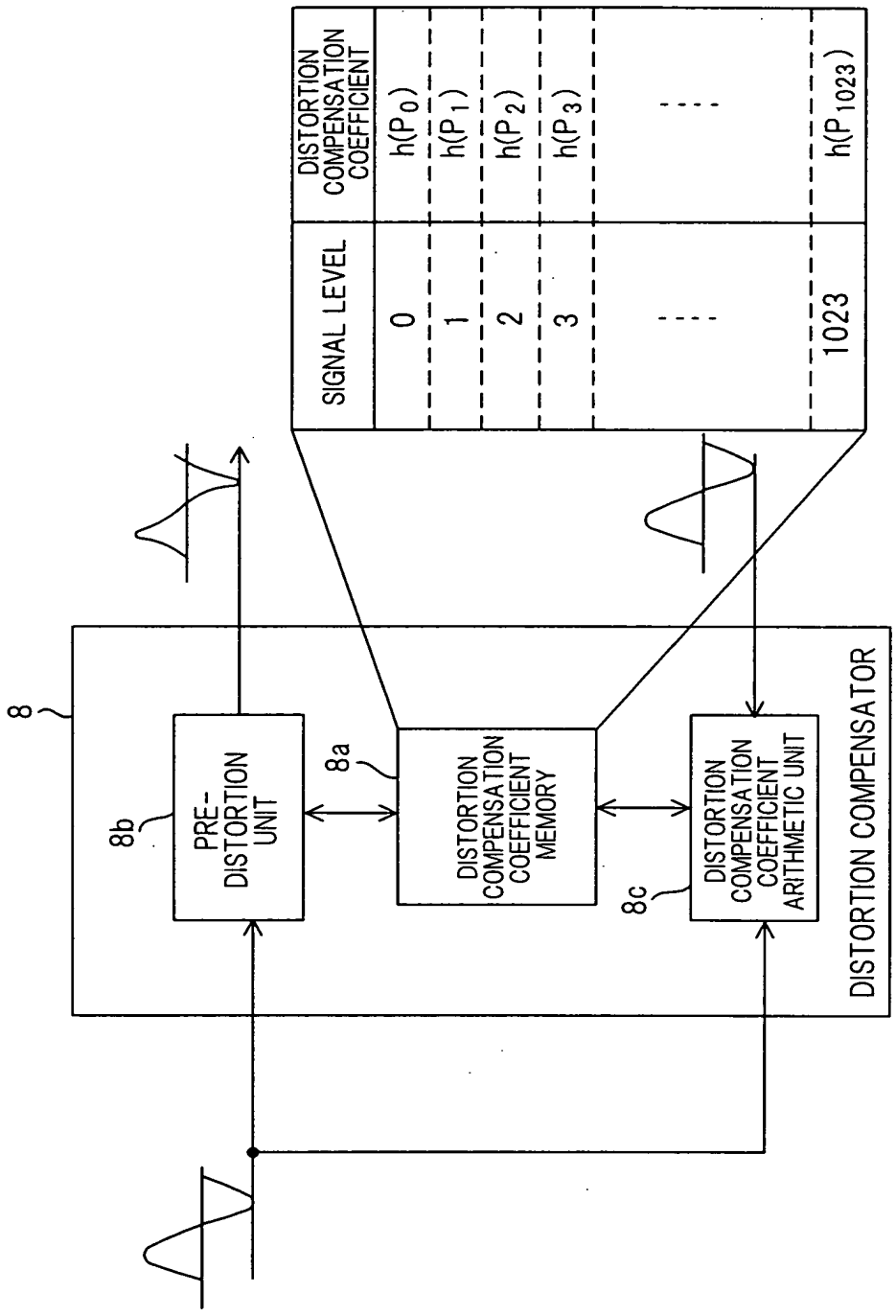
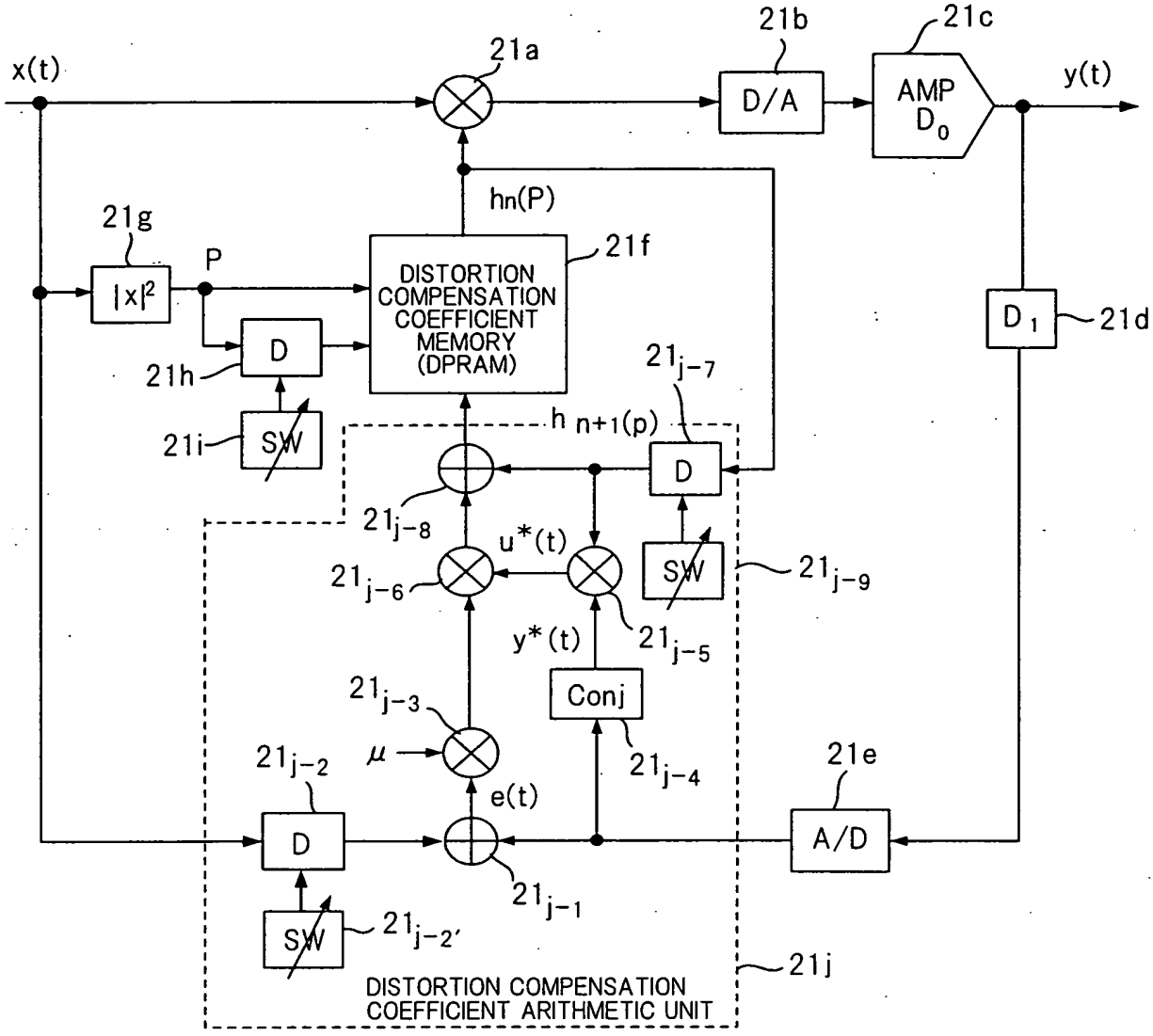
FIG. 27 PRIOR ART